

**Editor-in-Chief: Michael Wald**  
*Dublin Institute of Technology*  
*Dublin, Ireland*

**Contents**

<b>M. S. Wald</b>	617	Editorial
<i>Engineering Education Policy and Research</i>		
<b>S. Ratnajeevan H. Hoole</b>	618–626	Viewpoint: Human Rights in the Engineering Curriculum
<b>J. D. G. Foster and J. Uziak</b>	627–632	Engineering Education in Botswana
<b>James D. McCowan and Christopher K. Knapper</b>	633–637	An Integrated and Comprehensive Approach to Engineering Curricula, Part One: Objectives and General Approach
<b>James D. McCowan</b>	638–643	An Integrated and Comprehensive Approach to Engineering Curricula, Part Two: Techniques
<b>James D. McCowan</b>	644–651	An Integrated and Comprehensive Approach to Engineering Curricula, Part Three: Facilities and Staffing
<b>Peng-Kiat Pek and Kim-Leng Poh</b>	652–666	Formulation of Tutoring Policy for Maximising Student Learning using a Decision-Theoretical Approach
<i>Mechatronics</i>		
<b>F. L. Tan, S. C. Fok and E. K. Ong</b>	667–673	A Pole Balancing Cart on an Unmodelled Terrain
<i>Chemical Engineering</i>		
<b>J. M. Lopes, F. Lemos, C. Pinheiro, F. Ramôa Ribeiro, F. D. Magalhães, A. Mendes and C. Costa</b>	674–681	Teaching Residence Time Distributions in the Laboratory
<i>Building and Construction Engineering</i>		
<b>Nabil Kartam and Khaled Al-Reshaid</b>	682–696	Design and Implementation of Web-based Multimedia Techniques for Construction Education
<i>Control Engineering</i>		
<b>C. Mei</b>	697–703	On Teaching the Simplification of Block Diagrams
<b>Ali El-Hajj, Sami Karaki and Karim Kabalan</b>	704–710	Graphical Simulation of an Analog Computer Using Spreadsheets
<i>Distance Controlled Laboratories</i>		
<b>William J. Hutzler</b>	711–716	A Remotely Accessed HVAC Laboratory for Distance Education
<i>Environmental Engineering</i>		
<b>Göran I. Broman, Sophie H. Byggeth and Karl-Henrik Robèrt</b>	717–724	Integrating Environmental Aspects in Engineering Education
<b>James N. Craddock and Lizette R. Chevalier</b>	725–731	Development and Formative Assessment of Web-Based Multimedia Labware for an Environmental Engineering Laboratory
<i>Manufacturing Engineering</i>		
<b>Ismail Fidan and Ahmed Elsayy</b>	732–735	The Development of a Knowledge-Based Engineering Tool for CNC Machining
<i>Electrical and Electronic Engineering</i>		
<b>Henning Siemund and Holger Goebel</b>	736–744	A Web-assisted Electronics Course using the S.m.i.L.E Program
<b>Matthew N. O. Sadiku, Keming Gu and Clarence N. Obiozor</b>	745–752	Regional Monte Carlo Potential Calculation Using Markov Chains

INDEXED/ABSTRACTED IN: INSPEC DATABASE  
*Science Citation Index/Current Contents*

# The International Journal of ENGINEERING EDUCATION

## EDITOR-IN-CHIEF

**M. S. Wald**, Dublin Institute of Technology, Bolton Street, Dublin, Ireland  
Tel: (International) +353 27 61400; Fax: (+353 1) 4023999; E-Mail: [ijee@eircom.net](mailto:ijee@eircom.net)  
Website: <http://www.ijee.dit.ie>. Editor's direct phone: (+353 27) 61400.

## ASSOCIATE EDITORS

**C. Kuo**, University of Strathclyde, 100 Montrose St., Glasgow G4 0LZ, Scotland  
Tel: (International +44-141) 552 4400; E-mail: [c.kuo@strath.ac.uk](mailto:c.kuo@strath.ac.uk)  
**L. S. Fletcher**, Department of Mechanical Engineering, Texas A&M University, College Station, TX 77843, USA  
**D. McCarthy**, Dublin Institute of Technology, Bolton St., Dublin, Ireland  
**M. Murphy**, Dublin Institute of Technology, Bolton St., Dublin, Ireland  
**J. Turner**, Dublin Institute of Technology, Bolton St., Dublin, Ireland

## BOARD OF EDITORS

**C. Y. Lam**, School of Mechanical and Production Engineering, Nanyang Technological University, Singapore 639798  
**R. Natarajan**, Chairman, All India Council for Technical Education, New Delhi, India  
**C. S. Slater**, Department of Chemical Engineering, Rowan College, Glassboro, NJ 08028, USA  
**S. Waks**, Department of Education in Technology & Science, Israel Institute of Technology, Haifa 32000, Israel

## EDITORIAL ADVISORY BOARD

**Caroline Baillie**, Department of Materials, Imperial College of Science, Technology and Medicine, London SW7 2BP, United Kingdom  
**F. Bodendorf**, Department of Information Systems, University of Nuremberg-Erlangen, Germany  
**E. Eder**, Royal Military College of Canada, Kingston, Ontario, Canada K7K 5L0  
**Nesimi Ertugrul**, Department of Electrical and Electronic Engineering, University of Adelaide, 5005 Australia  
**I. Gibson**, Industrial Engineering Department, National University of Ireland, Galway, Ireland  
**Denis Gillet**, Automatic Control Laboratory, Swiss Federal Institute of Technology, CH-1015, Lausanne EPFL, Switzerland  
**J. Jawitz**, Faculty of Engineering and Built Environment, University of Cape Town, South Africa  
**R. C. Jones**, World Expertise LLC, 2001 Mayfair McLean Court, Falls Church, VA 22043-1761, USA  
**Paul King**, Department of Biomedical Engineering, Vanderbilt University, Nashville TN 37235, USA  
**T. Kurfess**, George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta GA 30332, USA  
**K. Mallalieu**, Electrical & Computer Engineering, University of West Indies, St. Augustine, Trinidad  
**J. F. Marchman**, Aerospace & Ocean Engineering Department, Virginia Tech, Blacksburg, VA 24061, USA  
**Etsuo Morishita**, Department of Aeronautics and Astronautics, University of Tokyo, Japan  
**C. Newberry**, Aeronautics and Astronautics, Naval Postgraduate School, Monterey, CA 93943, USA  
**Terrance O'Brien**, Department of Curriculum and Instruction, North Carolina State University, Raleigh NC 27695, USA  
**T. Owens**, Dept. of Electrical Engineering and Electronics, Brunel University, Uxbridge, UB8 3PH, UK  
**S. Pomeranz**, Department of Mathematical and Computer Sciences, University of Tulsa, Tulsa, OK, USA  
**Z. J. Pudlowski**, Faculty of Engineering, Monash University, Clayton, Melbourne, Vic 3168, Australia  
**N. J. Salamon**, Engineering Science and Mechanics, The Pennsylvania State University, University Park, PA 16802, USA  
**Sheri D. Sheppard**, Mechanical Engineering, Stanford University, Stanford, CA 94305, USA  
**P. Shiue**, School of Engineering, Christian Brothers University, Memphis TN 38104, USA

---

## 2002 Subscription Rates (including postage and insurance)

Annual institutional subscription rate £360. Personal subscription rate for those whose library subscribes £95. For North American institutional subscribers \$525. Subscription enquiries should be sent to TEMPUS Publications, Dublin Institute of Technology, Bolton St., Dublin, Ireland. Tel: (+353 1) 4023605, Fax (+353 1) 4023999.

## Back Issues

Back issues available from TEMPUS Publications.

Copyright © 2002 TEMPUS Publications

Published 6 per annum

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

## Photocopying Information for Users in the U.S.A.

The Item-fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying beyond that permitted by Section 107 or 108 of the United States Copyright Law, is paid. The appropriate remittance of \$3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970, USA.

## Permission for Other Use

The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying.

The Item-fee Code for this publication is: 0949-149X/92 \$3.00 + 0.00.

# The International Journal of ENGINEERING EDUCATION

## AIMS AND SCOPE

This journal serves as an international interdisciplinary forum and source of reference for engineering education. A balance between papers on developments in educational methods and technology, case studies, laboratory applications, new theoretical approaches, educational policy and survey papers is aimed for. Comprehensive coverage of new education schemes and techniques makes the journal a unique source of ideas for engineering educators who are keen to keep abreast with latest developments in educational applications in all fields of engineering. The journal will cover engineering education news and open debates on engineering education policy related topics of transnational interest.

Some of the areas covered more extensively in recent issues are: CAD, CAE, computer applications in teaching thermodynamics, materials science, electrical engineering, new courses and curricula, engineering management, control engineering, mechanical engineering, engineering design, student evaluation and institutional accreditation.

Features are a series on world educational systems with reference to engineering and a software survey section. Special issues on topics such as computer-aided engineering, engineering thermodynamics and engineering design are published periodically.

## NOTES FOR CONTRIBUTORS

Papers for inclusion in the Journal should be submitted in duplicate to the Editor-in-Chief or to the most appropriate member of the Board of Editors or the Editorial Board. The Editor-in-Chief should be informed by the authors of any submission made directly to a member of either Board. The papers should include detailed information on relevance of the material to engineering education. Only papers not previously published will be accepted and, once accepted for the Journal, must not be published elsewhere. Technical Notes, Letters-to-the-Editor and Book Reviews may also be submitted. In addition to the paper in manuscript form papers should also be submitted on a diskette suitable for IBM PC or Apple Macintosh. News items of transnational interest, including courses and workshops, should be submitted to the Editor-in-Chief. Papers and Journal information are available on the World Wide Web on <http://www.ijee.dit.ie>

Papers must be submitted in English.

A brief summary (not more than 100 words) of the scope of each paper must be sent with the manuscript.

Authors are requested to submit a brief biographical sketch of up to 100 words for each author. Biographical sketches will be published with the paper unless requested otherwise.

The text, and as much of the mathematics as possible, must be typed with double spacing and ample margins on successively numbered pages.

The manuscript and diagrams will be discarded one month after publication unless the publisher is requested to return the original material to the author.

All photographs, schematics and diagrams should be referred to as figures and should be numbered consecutively and not included in the typescript. Name(s) of author(s), figure number and an indication of the orientation should be written on the back of each figure. Line diagrams should be drawn clearly in black ink with open lettering and be of sufficiently large size to allow for the necessary reduction. Photographs should be kept to a minimum and submitted as glossy prints. It is preferred to have graphics on diskette in GIF format.

In the interest of economy and in order to avoid the introduction of errors, tables will be reproduced directly from the authors' manuscripts. In case of difficulty please consult the Photoreprographic Unit of your institution. The following points should be observed during their preparation.

1. Insert heavy rules at the head and foot of each table, and fine rules below column headings.
2. The type should be clear and even.

Captions for figures and tables must be given on a separate sheet and included at the end of the manuscript.

The journal follows Le Système International d'Unités.

All Greek characters and unusual symbols must be identified by name in the margin the first time they appear.

References in the text to published literature should be given by numbers in square brackets on the line and the references should be listed at the end of the paper in numerical order.

Journal references should be arranged thus:

1. L. A. Pipes, Matrix analysis of heat transfer problems. *J. Franklin Inst.* **263**, 195–206 (1957).

Book references should be given as:

2. P. H. Parkin and H. R. Humphreys, *Acoustics, Noise and Buildings*, p. 84. Faber, London (1961).

Abbreviations of journal titles will follow *World List of Scientific Periodicals*.

Proofs will be sent to the first-named author for correction, unless otherwise specified. Corrections must be restricted to printer's errors only. Other than these, any substantial changes may be charged to the author.



*A selection of papers accepted for publication*

**Bronet, Eglash, Gabriele, Hess, Kagan**—Product Design and Innovation: Evolution of an Interdisciplinary Design Curriculum

**King, Fries**—Biomedical Engineering Course Content

**Cheng, Lyu, Lin**—Education Improvement through ISO9000 Implementation: Experience in Taiwan

**Carryer**—Teaching Embedded Program Concepts to Mechanical Engineering Students

**Gupta**—A Design-Oriented Undergraduate Curriculum in Mechatronics Education

**Djodjevich**—Motion Control Demonstration for Easy Student Understanding

**Overveld**—Teaching Creativity in a Technological Design Concept

**Hubka, Eder**—Pedagogics of Design Education

**Narayanan**—Academic Leadership Strategies for Engineering Faculty

**Brent, Felder**—A Model for Engineering Faculty Development

**Meier**—Best Practice in Product Design

**Sardana, Arya**—Training Evaluation for Engineering Students

**Wackers, Korte**—Drift and Vulnerability in a Complex Technical System

**Vial-Donlai**—Using Embedded Internet Devices in an Internet Engineering Laboratory

**Belendez, Neipp, Belendez**—Cables under Concentrated Loads: A Laboratory Project for an Engineering Mechanics Course

**Eris, Leifer**—Facilitating Product Development Knowledge Acquisition: Interaction Between the Expert and the Team

**Herkert**—Professional Societies Microethics and Macroethics: Product Liability as an Ethical Issue in Engineering Design

**Carlson, Reitsma, Brandemuehl, Hertzberg, Sullivan, Gabbard**—Exploiting an Engineering Building as a Unique Distance Learning Tool

**Hansen**—Does Productivity Apply to PBL Methods in Engineering Education